

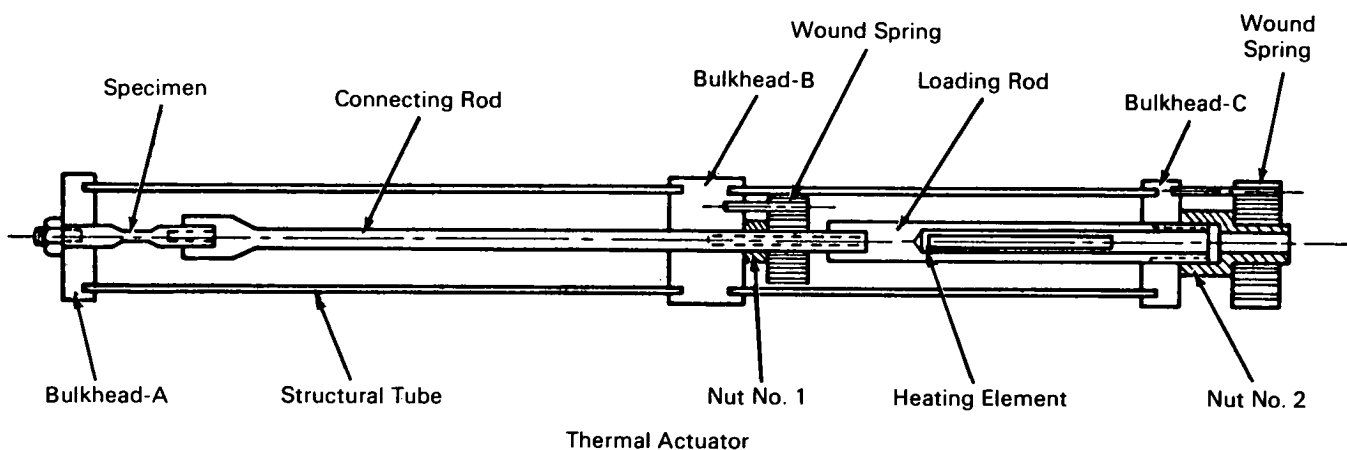


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Electrothermal Fracturing of Tensile Specimens



Tensile specimens can be fractured by use of a novel pulling device. The method is useful for extreme environments such as cryogenic temperatures or nuclear radiation, and in any situation where pulling-force access is limited. The original device was designed to operate within a 30-in. length of 8-in. (inner diameter) tubing containing helium at 50°R and 100 lb/in.²; the limited heat-removal capacity of the cryogenic system required the components to be of minimal weight.

The actuator consists of a structural tube, a connecting rod, two spring-loaded nuts, a loading rod, a heating element, and three bulkheads (see fig.); all are sized to match the desired tensile loads. First, the section of rod between nuts 1 and 2 is heated. As the rod expands, nut-2 tends to part from bulkhead-C, but the nut remains in contact with the bulkhead because it is forced by its spring to rotate on the threaded shaft.

Interruption of the heating (and resultant contraction of the rod) imposes a tensile load on the specimen

and tends to part nut-1 from bulkhead-B; but its spring rotates the nut on the threaded shaft and keeps it in contact with the bulkhead.

The distance of travel of nut-1 equals the elongation of the test specimen. Repetition of the heating cooling cycle increases the tensile loading by increments until the specimen is fractured. A load cell or strain gage, applied to the pulling rod, can determine the forces applied to the specimen. The device could be used for loading of irradiated test specimens in a nuclear reactor, to actuate valves, or to position heavy machinery; its simplicity is a highly attractive feature for remote applications.

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
AEC-NASA Space Nuclear Propulsion Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
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(continued overleaf)

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